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ABSTRACT

A program was implemented for increasing writing and problem solving skills to increase educational achievement. The targeted populations consisted of sixth and seventh grade students from two growing middle class suburban communities located in the Midwest. The problems of inadequate writing and problem solving skills were documented through data which included parent surveys, teacher observations, and assessments which indicate academic performance. Analysis of probable cause data revealed that teachers reported a lack of emphasis on various learning styles in instruction and assessment methods. Writing and problem solving skills appeared to be affected by insufficient motivation, relevance, and the teaching of basic content in isolation. A review of solution strategies suggested by others, combined with an analysis of the problem setting, resulted in the selection of an intervention consisting of four components: developing materials that foster student interest, learning activities that address various learning styles, curriculum units reflecting these decisions, and creating and implementing relevant assessments. The content focus was on problem solving and writing skills. Following the intervention, students' problem solving and writing skills increased as well as their self-confidence and motivation. These resulted from a combination of material, curricular, and assessment modifications. (Contains 2 figures, 7 tables of data, and 34 references; appendixes contain student surveys about writing and problem solving, teacher interviews about student writing and problem solving, a language arts pretest, the language arts rubric, a mathematics pretest, a language arts posttest, and a mathematics posttest.) (Author/CR)

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ED 420 876

IMPROVING WRITING AND PROBLEM SOLVING SKILLS OF MIDDLE SCHOOL STUDENTS

Margaret Mills
Patricia Stevens

An Action Research Project Submitted to the Graduate Faculty of the

School of Education in Partial Fulfillment of the

Requirements for the Degree of Master of Arts in Teaching and Leadership

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ABSTRACT

This report describes a program for increasing writing and problem solving skills in order to increase educational achievement. The targeted populations consist of sixth and seventh grade students from two growing middle class suburban communities located in the Midwest. The problems of inadequate writing and problem solving skills were documented through data which included parent surveys, teacher observations, and assessments which indicate academic performance.

Analysis of probable cause data reveal that teachers report a lack of emphasis on various learning styles in instruction and assessment methods. Writing and problem solving skills appear to be affected by insufficient motivation, relevance, and the teaching of basic content in isolation.

A review of solution strategies suggested by others, combined with an analysis of the problem setting, has resulted in the selection of an intervention consisting of four components: developing materials that foster student interest, learning activities that address various learning styles, curriculum units reflecting these decisions, and creating and implementing relevant assessments. The content focus was on problem solving and writing skills.

Students' problem solving and writing skills increased as well as their self confidence and motivation. These resulted from a combination of material, curricular, and assessment modifications.

CHAPTER 1

PROBLEM STATEMENT AND CONTEXT

Problem Statement

The students of the targeted sixth grade language arts classes and the seventh grade mathematics classes exhibit a lack of achievement in the areas of writing and problem solving skills. Evidence for the existence of the problem include parent surveys, teacher observations, and assessments that indicate academic performance.

Immediate Problem Context

Site A

Site A is located in a western suburb of a large midwestern city. The total enrollment of the school is 418 students. There are a total of four schools in the district: two elementary, one junior high, and one senior high school. From the total population of students, the following is a breakdown of their ethnic characteristics: 84.5% White, 6.8% Black, 2.4% Hispanic, 6.3% Asian/Pacific Islander, and no Native American. Site A has an attendance rate of 95.2% with one chronic truant. There is a rate of 23.9% student mobility. The average class size is 26 students with the following minutes for instruction of core subjects: 42 for mathematics, 42 for science, 84 for English, and 42 for social science (School Report Card, 1997).

Site A's district has a total number of 103 teachers. The average teaching experience is 14.5 years with 43.8% of the total number of teachers who have earned a Master's Degree or above. The total number of district teachers is composed of 72.8% female and 27.2% male teachers. The district's faculty has a racial/ethnic background comprised of the following: 99.0% White, 1.0% Black, no Hispanic, Asian/Pacific Islander, or Native American. The average teacher's salary in Site A's district $50, 391. The average administrator's salary is $81,215 (School Report Card, 1997).

Site A is a 41-year-old, one-story building currently undergoing installation of air conditioning and updates in the areas of computers and technology. The students are non-segregated within the building. Site A's teachers do not team-teach or have a common planning time. The sixth grade language arts curriculum includes spelling/vocabulary lessons, grammar exercises, and composition of various types of paragraphs and essays. Their quarter grades are determined by homework completion, class participation, test scores, and their writing assignments. Sixth grade students are also administered the State Goal Assessment Program tests in March. The students are tested in the areas of reading, writing, and mathematics.

Site B

Site B is located in a far west suburb of a large midwestern city. It has a total enrollment of 721. There are a total of 15 schools in the district: 11 elementary, 3 middle, and 1 high school. Site B's population comes from three of the district's elementary schools. From the total student population of Site B, the following is a breakdown of ethnic characteristics: 95.7% White, 0.6% Black, 2.1% Hispanic, 1.7% Asian/Pacific Islander, and no Native Americans. Site B has an

attendance rate of 95.8% with no chronic truants. The student mobility rate is 5.1%. Site B has an average class size of 23.0 with the following minutes per day for instruction of core subjects: 50 for mathematics, 50 for science, 75 for language arts, and 50 for social science (School Report Card, 1997).

Site B is located in a district that has a total of 513 teachers. The average teaching experience is 12.8 years with 56.2% of the total number of teachers having attained a Master's Degree or above. The total number of district teachers is comprised of 74.9% female and 25.1% male. The district's teacher racial/ethnic background is broken down as follows: 99.6% White, 0.2% Black, 0.2% Hispanic, and no Asian/Pacific Islander, or Native American. The average teacher's salary in site B's district is $42,624, while the average administrator's is $74,784 (School Report Card, 1997).

Site B is a 39-year-old two-story building in need of air-conditioning and updating. The sixth grade population is segregated within one hallway with the seventh and eighth graders non-segregated within the building. Site B utilizes a team approach with each grade level divided into two teams. Each team is comprised of four core-subject teachers, two allied-arts teachers, and approximately 130 students. There is a common planning time and weekly team meetings. The seventh grade mathematics program uses Transition Mathematics (Uniskin et al., 1990). The University of Chicago School Mathematics Project.

The Surrounding Community

Site A

Site A's district has a population of 1,699 students who attend two elementary schools, one junior high school which has a total population of 411 students, and one senior high school. The

community is located 26 miles west of a large midwestern city. The community's population is 19,584. Twenty-six percent of the population is under the age of eighteen and 4.9% are over the age of sixty-five. The average age of this community is 31 (Village Demographics, 1990).

Of the total population, 84.5% are Caucasian, 2.8% are African-American, 0.2% are American Indian, 5.0% are Asian/Pacific Islander, and 3.1% are Hispanic. Demographic data indicates that the community is predominately upper-middle class with an average income of $62,600. The average home value in the community is $174,758. The community has 4,066 detached single family homes and 4,634 multi-family dwelling units. The parents of this school district work in a variety of careers from unskilled to skilled laborers and as professionals such as doctors and dentists (Community Census, 1990).

Site B

Site B's district has a population of 9300 students who attend 12 elementary schools, 3 middle schools, and 1 senior high school. The community is located 45 miles west of a large midwestern city. The community's population is 25,300. Twenty-five percent of the population is under the age of eighteen and 5.4% are over the age of sixty-five (Chamber of Commerce, 1996).

Of the total population, 92.1% are Caucasian, 0.6% are African-American, 4.3% are Asian/Pacific Islander, and 3.1% are Hispanic. Demographic data indicates that the community is predominately upper-middle class. The average home value in the community is $176,685 (Community Census, 1990).

National Context of the Problem

The lack of problem solving and writing skills has generated concern at the state and

local levels. This deficiency has become more apparent as societal and technological changes cause a shift from basic grammar and computation skills. According to Whally (1995),

> The days of lifelong employment in a single company or even the same occupation are rapidly disappearing. Our children can no longer think simply of investing in a body of knowledge that will stand them in good shape in the workplace; instead they will face a work environment where a premium will be placed on adaptability, on acquiring new skills, new information, new knowledge, on being, in the current phrase, lifelong learners (p. 4).

In order for students to become more adaptable, Haas (1995) stresses the need for better performance in several areas such as mathematics and the arts and humanities. He suggests the implementation of programs to enhance "better learning and communication skills to expedite these performances, including reading, writing, listening, speaking, logic, and computer skills" (p. 99).

In recent years there has been an increased emphasis on integrating, writing and communicating across the disciplines. Burns (1995) explains that the processes of writing and problem solving both require gathering, organizing and classifying thoughts. She finds that "the mental journey is, at its base, the same - making sense of an idea and presenting it effectively" (p.3).

These concerns have been in existence for years. In 1989, President Bush and the nation's governors called for an Educational Summit. Shepard's study says (as cited in Kendall and Marzano, 1997) one goal relates specifically to academic achievement:

By the year 2000, American students will leave grades 4, 8, and 12 having demonstrated competency in challenging subject matter including English, mathematics, science, history and geography; and every middle school in America will insure that all students learn to use their minds well, so that may be prepared for responsible citizenship, further learning, and productive employment in our modern economy (p. 27).

CHAPTER 2

PROBLEM DOCUMENTATION

Problem Evidence

Over the past three years it has been observed and noted by language arts and mathematics teachers that students demonstrated low writing and problem solving skills when given assignments. In order to assess the needs of the students, the results of standardized tests, parent and student surveys, teacher interviews, district mission statements, and pre-tests were used.

Site A

Site A is the location of the targeted sixth grade language arts class. Standardized test results have fluctuated over the past three years. A standardized test is administered to all of the sixth grade students in the state who attend public schools. One of the areas tested is essay writing. The results are shown in Table 1 (State Goal Assessment Program, 1997).

Table 1

State Assessment Results of Sixth Grade Writing March, 1995 Through March, 1997

Year	Average Score	Comparison Score Band
1995	25.2	24.8 - 25.6
1996	24.7	24.1 - 25.3
1997	25.2	24.8 - 25.6

Out of a possible score of 32, most sixth grade students tested during 1995 through 1997 scored higher than the state average of 22.7. Although the majority of students in Site A met or exceeded the state goals, there was a small percentage of students whose performance was below the state average. There is a strong emphasis in the district to shift the students' scores to the next level of performance. Although scores have shown improvement within the past year, they do not meet the standards set by the district and its community. The district's mission statement is to provide and maintain a community in which students, parents, and staff develop an appreciation for each other in conjunction with a quest for continual intellectual growth. These goals compel the students to perform to their fullest potential.

The classroom teacher developed surveys (Appendix A) which were given to a class of 22 heterogeneously grouped sixth grade students concerning their attitudes about their writing skills and performance. The results are shown in Table 2.

Table 2

Distribution of Responses to Student Survey

Question	1	2	3	4	5	6	7	8	9	10	11	12
Strongly Agree	7	5	2	2	4	4	4	5	3	5	2	11
Agree	14	15	10	6	8	8	11	7	13	7	16	9
Disagree	1	2	8	9	9	9	4	6	3	9	2	1
Strongly Disagree	0	0	2	5	1	1	3	4	3	1	2	1

The student survey shows that students feel they do well on multiple choice and short answer tests. On the other hand, 64% of the students surveyed feel they do not do well on essay tests. A factor that might contribute to this feeling is that 54% of the students feel they know more about writing than their oral and written responses reflect. In addition, over half of the students

surveyed are not confident in applying their writing skills on their own. They have even less confidence in transferring their writing skills in other classes. Eighty-three percent of the students feel they have opportunities to show what they know through their writing. The majority of the 83% struggle in the areas of brainstorming and supporting their main ideas. Consequently, there is a decrease in both confidence and their quality of work.

Five language arts teachers in Site A were surveyed about their feelings in relation to students' writing skills. The teacher interviews (Appendix B) show that many responses were similar in relation to the writing skills of students. All of the language arts teachers feel students have difficulty with writing skills. They base this on written evaluation, students struggling with writing, students having a negative opinion of writing, as well as their reluctance to work on writing assignments.

The teachers observe specific difficulties that include lack of paragraph development, poor mechanics, and difficulty brainstorming and adequately supporting their main ideas. They feel the causes of these difficulties are derived from not understanding the need for writing skills and how they will incorporate these skills in the future. It is also believed that many students rush through an assignment just to complete it.

Although Site A's students perform above the norm on standardized tests, teachers feel they do not perform to their potential. Instructors continue to encourage students to improve their writing by employing various motivating techniques. They stress the importance of writing across the curriculum in order to allow students more opportunities to write as well as being able to see the importance of it in their daily lives.

A pretest (Appendix C) in essay writing was administered to a class of sixth grade heterogeneously grouped students. They were given 42 minutes to complete an essay on a teacher-selected topic. No prior instruction was given and assistance was not available during the pretest. Out of 35 possible points, scores ranged from 10 to 27 with 19 being the average. The essays were evaluated, using a rubric (Appendix D), by the classroom teacher in the following areas: focus, organization, support/elaboration, conventions, and format.

There were two areas with which students found the most difficulty. Their work displayed a lack of organization, resulting in an average of 5 out of a possible 12 points. Development of support/elaboration was lacking in their essays, resulting in an average of four out of a possible nine. Conversely, knowledge of spelling and grammar rules was indicated in their essays, resulting in an average of two out of three possible points. This indicates knowledge of basic grammar rules, but shows a lack of ability in incorporating this knowledge with more advanced writing skills.

Site B

Site B is the location of the targeted seventh grade mathematics class. Its district administers standardized tests to all grade levels during the second week of March each year. Tests are presented in a regular classroom setting with as little deviation from the regular schedule as possible. The state tests all sixth grade public school students in reading, writing and mathematics. There are several specific concentrations in each content area. One of the subtests in mathematics focuses on problem solving. The results of this subtest for the last three years are shown in Table 3 (State Goal Assessment Program, 1997).

Table 3

State Assessment Results of Sixth Grade Problem Solving March 1995 Through March 1997

Year	Average Score	Comparison Band
1995	317	296 – 332
1996	332	314 – 346
1997	348	331 – 363

Out of a possible score of 500, the majority of students tested during 1995 through 1997 scored higher than the state average of 277. However, there was a group of students whose performance did not meet the state goals. Because these results are published on the front pages of the community newspapers, they become the standard by which the public judges the caliber of each local school district. These scores show a lack of achievement when compared to neighboring districts.

Site B's school district also administers a standardized test to seventh graders which includes a subtest in problem solving. The results for the last three years are shown in Table 4 (The Psychological Corporation, 1989).

Table 4

Stanford Results of Seventh Grade Problem Solving March 1995 Through March 1997

Year	Percent Below Average	Percent At Average	Percent Above Average
1995	4	40	56
1996	5	38	58
1997	6	42	53

The community puts emphasis on this particular assessment because it is a national rather than a state test. It does not accept average test scores and seeks improvement of students who are performing at or below the national average. Although the majority of the scores on both of the standardized tests are above the state average and the national norm, they are not considered acceptable by the school district and the parents in the community. A comparison of these results with neighboring districts shows a lack of achievement in this area.

The mission statement calls for an educational system which is in partnership with an involved and supportive community. One of the strategic objectives is a high level of community approval. In 1996, each parent in the district was asked to participate in a parent satisfaction survey. With a 42% return rate, 53% made written comments. Fourteen issues received five or more remarks, with one of these being concerns about problem solving (Shoemaker, !996).

Surveys (Appendix E) were developed by the classroom teacher and administered to a class of 24 heterogeneously grouped seventh grade students asking for attitudes toward problem solving and performance. They were given a choice of four responses: strongly agree, agree, disagree, and strongly disagree. The results are shown in Table 5.

Table 5

Distribution of Responses to Student Survey

Question	1	2	3	4	5	6	7	8	9	10
Strongly Agree	4	8	6	2	10	9	6	3	4	18
Agree	10	12	6	6	8	9	12	4	8	4
Disagree	10	3	8	7	6	4	6	10	8	2
Strongly Disagree	0	1	4	9	0	2	0	7	4	0

Student surveys show that 80% of the students prefer true-false tests. This can be attributed to the fact that they feel they have a 50% chance of a correct answer by merely guessing. The least favored form of assessment is essay, which offers no choices. Seventy-two percent of the respondents feel they know more about problem solving than their written and oral responses show. Only 28% show confidence in their ability to apply problem-solving skills on their own. Fifty percent of those surveyed stated that they have opportunities to show what they know. A majority of the students strongly agreed that they understand the mathematics grade they earn on their report cards.

Three mathematics teachers in Site B were surveyed asking for their views on several issues concerning problem solving. Teacher interviews (Appendix F) indicate that the majority of students have difficulty with solving word problems. Even those students with the highest ability show a propensity toward low achievement in this area. The teachers cite standardized test results, classroom quiz and test scores, and a higher level of homework incompletion when it involves problem solving as justification .

Specific observations show students displaying difficulties with grasping key information, including what the question is they are to answer. The students exhibit a lower frustration level when dealing with word problems rather than algorithms, which are mathematical problems with only numbers and symbols. They fail to see the relevancy and struggle in choosing an appropriate problem solving strategy. Teachers believe many students try the guess and check method a few times and then just give up. The instructors suggest finding ways to improve student motivation and lower frustration levels.

A diagnostic pretest (Appendix G) of six story problems was administered to a class of heterogeneously grouped seventh grade students. The students were given 50 minutes to complete the assignment. Each question was designed to lend itself to a unique problem solving strategy. However, they were instructed to solve the problems using any method they deemed appropriate. No assistance was given. The results are shown in Table 6.

Table 6

Percent of Correct Responses on Problem Solving Pretest

Question	1	2	3	4	5	6
Percent Correct	33	42	38	58	67	54

These scores result in a mean of 48.7% with a range of 33% to 67%. These outcomes indicate a lack of achievement in all six problem solving strategies with those of questions one and three being the most difficult. Students displayed a high level of impatience and frustration throughout the process.

Probable Causes

Site-Based Causes

There are many factors that influence the achievement of middle school students. Teachers at both sites are unanimous in their belief that one contributing factor is a lack of motivation. They feel that the students do not see the relevancy of writing skills as well as problem solving skills to their everyday life or to their future. Because the students from both sites are fairly affluent, they have been exposed to more technology-based resources outside of school and tend to be uninterested with the more traditional paper and pencil activities of school. Teachers cite a lack of both writing and reading for pleasure. During back-to-school student surveys, an average

of three students per class of 28 reported that they had read more than one book and/or created an original piece of writing during the summer. During the school year, students at both sites have the opportunity to utilize the computer labs and media centers before and after school and during study halls. The check-in lists show the computer lab is always at capacity while the media center is underutilized. Students are both sites are eager to spend hours playing logic games on a computer as opposed to spending time creating an essay or a solution to a logic problem.

Literature-Based Causes

The literature suggests many possible causes for lack of achievement in writing and problem solving. In the past, textbooks have been a collection of cut and dry material. Often they are outdated to the point where students see no relevancy of the content. Research shows that a student will not be engaged in a problem or writing assignment until that student adopts it as his own (Schoenfeld, 1989). Students need to find their own way of interpreting an idea, relating it to their personal life experiences, seeing how it ties in with what they already know, and what they think about related ideas (Daniels, Hyde, & Zeleman, 1993).

Although each individual is born with different capacity levels, intelligence can be taught. The highest refinement of intelligence is achieved when the ability to problem solve transfers to real life. Increasing problem solving capabilities is achieved by creating conditions that foster development and eliminating those that hinder it (Chapman, 1993).

Some educators feel that assessment is often the missing link in effective school programs. Several have described most existing methods of assessment as archaic. There is still too much emphasis on testing that is aimed at inert knowledge contained in students' short-term memory

(Brown, 1989). In the past, teacher training emphasized changes in teaching strategies and curriculum. Teachers began to incorporate these new ideas which encouraged the students to expand their thinking and creativity. However, most of the teachers still employ traditional methods of assessment at the end of these units. Students get mixed signals as to what is valued (Burke, 1997).

The following is a summary of the probable causes for the problem. This information was obtained from the sites and professional literature:

1. Low levels of student motivation
2. Lack of relevancy
3. Different learning styles
4. Poor methods of assessment

CHAPTER 3

THE SOLUTION STATEGY

Literature Review

Analysis of probable cause data and research literature suggests that there is a need for modifications in instructional and assessment strategies in order to improve student achievement in writing and problem solving skills. In the past, the emphasis on instruction was to treat the student's mind as an empty vessel to be filled, causing the learner to be a passive participant (Thornburg, 1991). Educational literature addresses the areas of students having more input to the educational process, implementing teaching strategies based on the various learning styles of the students, and the use of student reflections, graphic organizers and peer/group editing. It also supports less traditional methods of assessments such as portfolios, checklists, and rubrics.

Constructivism is emerging as an important tool in education. It is a methodology that allows the core of the curriculum to be addressed, but the focus of the peripheral subject matter is directed by the students. For example, the concept of quadrilaterals is taught in a teacher-directed lesson. Follow-up lessons are based on student inquiries, such as constructions, making mobiles of the different shapes, drawing a picture with only quadrilaterals, etc. Students need to be active participants in all aspects of the educational process (Knapp & Peterson, 1983). Their motivation is heightened when they are able to feel a sense of ownership. Students are

encouraged to solve problems and to write compositions that are relevant to their lives (Daniels, Hyde, & Zemelman, 1993). This is accomplished by allowing part of the curriculum to be driven by the individual interests of the students in order to make the subject material more relevant. These interests are the vehicle by which the student informs and makes a connection with the world around him (D'Arcy et al., 1985). This is partially achieved by a student-generated list of interests which is used for future topics in writing essays and story problems.

Acknowledging the various learning styles of the students is an important tool in helping students be as successful as possible. Each student has a unique mix of how he or she perceives, processes, and prefers to exhibit information. For example, students standing in front of the room and reading their own writing or explaining a problem solution often feel threatened with peers as the audience. Students may not feel confident about their work, or may have gone against the norm, and/or may be afraid that their classmates will make fun of them. As a result, activities could be designed with choices in the way the student produces the final product. It is important to inform students of the various possibilities of presenting their work to the class (Frank, 1995).

Teaching in the areas of mathematics and writing is more than placing an emphasis on computation and grammar. Educators are shifting from a drill and practice orientation to developing critical thinking skills (Schoenfeld, 1989). These skills transfer not only to other subjects but also to daily life, not only as a student but also as an adult. Adults face few situations in which they are given a short list of choices for a solution. Daily life requires the use of an ever-changing combination of critical thinking skills. Therefore, teachers are concerned with every

aspect of student work. Weight is placed on the process as well as the product (Corcoran-Nielsen & Gay, 1995). Open-ended possibilities, rather than being restricted to a narrow set of parameters, allows the students to employ their creativity and independence. This use of their imagination will also aid in fueling their persistence (Bernays & Painter, 1990).

In association with addressing the students' learning styles, student reflections can be used for various purposes. They enhance metacognition, and enable the teacher to learn about the students' thinking (Burns, 1995). Writing in all content areas provides a way to extend their understanding of concepts (Routman, 1994). Students need both time and the opportunity to examine how they solve problems, come to conclusions, and see other students' strategies (Williamson, 1995). Student feedback is important at all levels of instruction, but it is essential during the middle grade years when students need teachers who are sensitive to their social, physical, intellectual, and psychological needs (Schurr, 1991).

While planning the curriculum, teachers incorporate strategies that will be beneficial to students. They take into account what is valued in the learning processes involved in a particular topic and attempt to address each student's individual needs. Regardless of the topic, assisting the students in logical reasoning and process strategies enables them to be successful. When possible, the use of graphic organizers, rather than relying on visualization and guess and check, provide a concrete basis for logical processing. A particular graphic organizer enables students to see their thinking (Bellanca, 1990).

Student-centered rather than teacher-directed classrooms promote communication skills, self-directed learning, teacher as facilitator rather than dispenser of knowledge, peers as facilitators, and students as teachers. Peer editing is an important aspect of the learning process. Sharing

enables students to hear their ideas and allows for feedback from someone other than the teacher as they continue to think about a topic, problem, or revision of a draft or solution (Spear, 1988).

In addition to using materials that foster student interest, teachers may employ various types of assessments to evaluate student work. Portfolios, checklists, and rubrics are some examples of these. Students feel that what they do in their day-to-day activities is drastically different from what is on a test and even perceive a difference in the classroom atmosphere during test taking (Heglie-King & Higgins, 1997). Performance-based assessments are gaining importance in education because authentic assessment capitalizes on the actual work of the classroom, enhances student and teacher involvement in evaluation, and meets some of the accountability concerns of the school district (Perrone, 1991).

A student portfolio is one type of performance-based assessment that can be used. They have several useful purposes. Portfolios monitor students' growth in an organized way. Reviewing a sequence of documents assists teachers, students, and parents in assessing the progress of their students. Portfolios are partially controlled by the students. They can help decide what should be placed in their portfolio (McGerald & Nidds, 1997). Portfolios engage the teacher and student in considering the process as well as the product. The portfolio's greatest value is not the portfolio itself, but what the student learns while creating it (Arter, Culham, & Spandel, 1995).

In addition to portfolios, teacher observation checklists assist teachers in their assessment of student progress. They help determine teacher goals and priorities. Student checklists are a concrete visual aid for thinking through the processes necessary to be successful. With student

input, a list of the steps necessary to successfully complete an activity is generated by the class. Students will check off each step as it is completed. The process of constructing the checklist itself is often more important than its later use (Bridges-Bird, Goodman, K.S., & Goodman, Y.M. (1992).

Rubrics are an additional form of assessment. They diminish stress in students by creating a clear picture of the expected outcomes. For students to feel confident enough to perform well, standards and criteria need to be set in advance (Burke, 1997). It is beneficial for the students to be part of the decision-making process when creating a rubric. The class and the teacher develop the standards for the performance. The assessment tool helps ensure consistency and equity in the grading process (Belgrade, Burke, & Fogarty, 1994).

Project Objectives and Processes

As a result of increased instructional emphasis on constructivism, materials and curriculum addressing various learning styles, and in conjunction with relevant assessments during the period of October, 1997 to January, 1998, the sixth grade students from the targeted language arts class and the seventh grade students from the targeted mathematics class will increase their achievement in writing and problem solving skills, as measured by teacher-made assessments that indicate academic performance.

In order to accomplish the terminal objective, the following processes will be implemented:

1. Materials that foster student interest in problem solving and writing skills will be developed.

2. A series of learning activities that address various learning styles in problem solving and writing skills will be developed.

3. Curricular units using graphic organizers and different teaching strategies will be constructed.

4. Relevant assessments will be created and implemented.

Project Action Plan

I. Materials and activities that foster student interest

A. Constructivism

1. Student interest list

a. Student creates list of self-interests such as family, hobbies, sports, pets, etc. during week 1

b. Student shares/modifies list with peers during week 2

c. List generates choices for writing topics and mathematics problems during intervention – to be used weeks 3, 4 , 5

2. Implementation of students' learning styles

a. Student activities - problem/essay of the week for six weeks

1. Emphasis on multiple intelligences - choice of topic/presentation during week 5

2. Value placed on process - solution steps/rough drafts during weeks 2, 3, 4

b. Student reflections - monitor progress/areas for improvement/future goals during weeks 1, 2, 3, 4, 5, 6

B. Curriculum planning

1. Introduction of graphic organizers

a. Teacher-made - when applicable during weeks 2, 3

b. Established models (Foggerty & Bellanca, 1993) during weeks 2, 3

c. Student-made during weeks 3, 4

2. Peer/group editing - feedback for work in progress during weeks 2, 3, 4

II. Assessments

A. Portfolios

1. Teacher-choice (teacher selects 2 pieces)

2. Peer-choice (other student selects 2 pieces)

3. Student -choice (student selects 3 pieces)

B. Checklists

1. Teacher observation - teacher/students generate list of behaviors to be observed during class activities during weeks 1, 2

2. Student working - teacher/students generate list of steps to be used in order to complete task during weeks 2, 3

C. Rubrics

1. Performance - teacher/student generated, to be used weeks 3, 6 in both content areas

2. State assessment writing rubric - with student input, to be used weeks 1, 2, 3, 4

3. Problem solving rubric - with student input, to be used weeks 1, 2, 3, 4

Methods of Assessment

In order to assess the effects of these interventions, records will be kept on teacher and student checklists, student interest surveys, standardized tests, teacher interviews, and post-tests. Student interest lists and rubrics will be used as well as teacher observations. Portfolios and student reflections will provide further insight.

CHAPTER 4

PROJECT RESULTS

Historical Description of the Intervention

The terminal objective of the intervention addressed the need of a program for increasing writing and problem solving skills in order to increase educational achievement. Indications were that writing and problem solving skills appeared to be affected by insufficient motivation, relevance, the teaching of basic content in isolation, and a lack of emphasis on various learning styles in instruction and assessment methods. Therefore the terminal objective stated:

> As a result of increased instructional emphasis on constructivism, materials and curriculum addressing various learning styles, and in conjunction with relevant assessments during the period of October, 1997 to January, 1998, the sixth grade students from the targeted language arts class and the seventh grade students from the targeted mathematics class will increase their achievement in writing and problem solving skills, as measured by teacher-made assessments that indicate academic performance.

Site A

In the month of October, an essay pretest was given to a class of 24 students in the targeted sixth grade language arts class (Appendix C). The essay was assigned with no teacher assistance or prior teaching of the material. The pretest was graded but not recorded toward their overrall grade. During week one, students created a list of self-generated topics such as family, hobbies, etc. . The following week focused on students sharing and modifying their lists. This list of 15 topics generated choices for writing topics to be used during weeks 3, 4, and 5.

Once students selected a topic from the list, the classroom teacher introduced graphic organizers. Students were encouraged to use these or create their own. The teacher also went through a sample of the pretest essay topic. This allowed students to look at their pretest essay and see what areas they did well in and what areas could use improvement.

Rough drafts were written during weeks 2, 3, and 4. Peer editing was also used during this time. It allowed students to display their knowledge of writing and share it with their peers. Time constraints did not permit the students to write as many essays as originally planned.

Observation checklists were used during the editing phase of the intervention. A rubric (Appendix D) was created by the classroom teacher with some input of the students. Another strategy used for assessment was the assembly of student portfolios. The portfolios were comprised of teacher, peer, and student selections.

In conjunction with the writing topics and essays, students' learning styles were addressed and value was placed on the process of students' rough drafts during weeks 2, 3, and 4. The use of multiple intelligences was encouraged as students were asked to have a supplementary component with their essay. Students chose to make a poster, write a song, a poem, bring in artifacts, or create a different project based on their individual learning styles and interests.

Before taking the posttest, students reviewed by looking at their portfolios. The portfolios included their essays as well as student reflections. Student reflections were used throughout the intervention and allowed students to monitor their progress, see areas for improvement, as well as set future goals for the duration of the action plan. During the final week, the classroom teacher administered a posttest (Appendix H) to the students.

Site B

In the first week of October, a pretest (Appendix F) of six word problems was administered by the classroom teacher to the 25 students in the targeted seventh grade mathematics class. Each problem was designed to lend itself to a predetermined problem solving strategy. No preteaching or help was given. Pretests were returned with answers marked but students were told that the grades were not recorded. It was stressed that the students would be graded on improvement after many weeks of intervention.

It was planned to discuss, practice, create, and solve problems using a specific strategy each week. The time frame was too ambitious in order for the students to be successful and each strategy required approximately two weeks. This resulted in each of the stages of the intervention taking twice the length of time as originally stated in the action plan.

After the pretest was returned students generated individual self-interest lists using hobbies, sports, and pets as categories. Lists were shared in groups of three with each group deciding on three choices under each heading. A class list of 15 possible topics in each category was then created and posted. Students were later asked to write a mathematical word problem that lent itself to a predetermined problem solving strategy using those topics. These were used to generate a bank of problems to be solved by the class.

Each group of three students presented a student-generated problem and its solution twice during the intervention. The groups were given latitude as to the type of presentation, and many chose methods other than lecture. Several groups acted the problem out while others wrote and presented a song, poem, or poster. Two groups created and showed a video.

Approximately every two weeks, the classroom teacher discussed a pretest problem

(Appendix G), followed by a similar one. Specific "find out" questions and "right there" answers were introduced. Their names were derived from the fact that the information to create them could easily be found within the problem. These questions enabled the students to get started, organize their thoughts, and choose an appropriate problem solving strategy. Initially the teacher provided both the questions and answers, but as the intervention progressed, the students were able to write their own. Graphic organizers were introduced when appropriate and students were encouraged to create new ones as needed.

The individual student initially attempted to complete a similar problem by writing the "find out" questions and "right there" answers, showing the actual solving including any graphic organizers, and answering the specific question in the problem. This attempt was followed by a discussion and modification of work in groups of three. Students were encouraged to attempt the "find out" questions and show their work even if unable to achieve the correct final answer. Points were given for each part of the solution process. These practice problems were followed by group presentations of similar problems.

Observation checklists were used throughout the intervention, predominately during the group discussion/editing phase. Students were asked to reflect on their thoughts and attitudes throughout the project. These reflections allowed the students to monitor their progress, see areas for improvement, and use the metacognition as a tool in solving future problems. The classroom teacher, with student input, created two types of rubrics. The first was used to grade the work in progress and the final product of each problem solving strategy. The second was used to grade the group performances. Each student kept a portfolio of his or her work in progress and the final

product. These were used in the final student reflections and as a review before the posttest (Appendix I).

Presentation and Analysis of Results

In order to determine the success of increased instructional emphasis on constructivism, materials and curriculum addressing various learning styles, and more relevant assessments, several aspects of the intervention were examined. These included student surveys, teacher observations, student reflections, and student posttests.

Site A

After the intervention, the classroom teacher re-administered the student survey (Appendix C) to the targeted class of 22 heterogeneously grouped sixth grade students concerning their attitudes about writing skills and performance. The results shown in Figure 1 indicate the student attitudes before and after the intervention.

Question	1		2		3		4		5		6	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Strongly Agree	7	9	5	7	2	4	2	2	4	7	4	2
Agree	14	13	15	12	10	12	6	11	8	10	8	9
Disagree	1	0	2	3	8	5	9	7	9	4	9	6
Strongly Disagree	0	0	0	0	2	1	5	2	1	1	1	5

Question	7		8		9		10		11		12	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Strongly Agree	4	5	5	8	3	6	5	8	2	5	11	8
Agree	11	8	7	10	13	10	7	11	16	13	9	12
Disagree	4	6	6	2	3	4	9	3	2	3	1	2
Strongly Disagree	3	3	4	2	3	2	1	0	2	1	1	0

Figure 1: Distribution of Responses to Student Survey

The interventions appear to have made a positive impact in the attitudes of students in the areas of writing skills and their achievement. The surveys show that students did not alter their feeling about performance on multiple choice and short answer tests. On the other hand, there was a significant change in student attitudes about essay tests. Before the intervention, only 37% of students felt they did well on essay tests. Whereas 59% felt they did well after the intervention was concluded. In addition, over half the students surveyed in October did not feel confident in applying their writing skills on their own and displayed even less confidence transferring their writing in other classes. When given the postsurvey in January, 81% did feel confident in applying their writing skills on their own and 72% felt confident in applying their writing skills in other classes. Moreover, 90% of the students felt they understood where their writing grade comes from. This is an increase of 31% from last October. Student reflections attributed this to an increase in confidence. Additionally, teacher observations were a factor in students producing higher quality work. Consequently, there was a significant increase in both confidence and quality of student work.

A posttest (Appendix H) in essay writing was administered to the targeted class of sixth grade heterogeneously grouped students. Similar to the pretest, students were given 42 minutes to complete an essay on a teacher-selected topic. Assistance was not available during the posttest. A rubric (Appendix D) was used in evaluating the essays in the following areas: focus, support/elaboration, organization, conventions, and format. Out of a possible score of 35 points, scores ranged from 24 – 35 with 31 being the average. In October the average score was 19. There were two areas in which students showed the most improvement. Their work in January was well organized, resulting in an average of 9 out of 12 possible points. The average in

October was 5 points. Development of support/elaboration also increased in their essays, resulting in an average of 7 out of a possible 9. In addition, knowledge of spelling and grammar rules was indicated in their essays, resulting in an average of 2 out of a possible 3 points. The knowledge of basic grammar rules did not change since October, but the incorporation of this knowledge with more advanced writing skills was clearly displayed.

Site B

After the intervention, the classroom teacher re-administered the student survey (Appendix E) to the targeted mathematics class of 24 heterogeneously grouped seventh grade students. The results shown in Figure 2 indicate the student attitudes before and after the intervention.

Question	1		2		3		4		5	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Strongly Agree	4	4	8	6	6	7	2	4	10	5
Agree	10	11	12	14	6	10	6	13	8	6
Disagree	10	9	3	2	8	4	7	3	6	10
Strongly Disagree	0	0	1	2	4	3	9	4	0	3

Question	6		7		8		9		10	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Strongly Agree	9	4	6	3	3	6	4	9	18	18
Agree	9	5	12	8	4	12	8	13	4	5
Disagree	4	11	6	9	10	4	8	2	2	1
Strongly Disagree	2	4	0	4	7	2	4	0	0	0

Figure 2: Distribution of Responses to Student Survey

The intervention appears to have had a positive effect on the students' attitudes towards short answer and essay assessments. The number of students who feel they do well on short answer tests rose from 12 to 17 showing a 42% increase, while those who like essay tests rose

from 8 to 17, showing a 113% increase. In October, only seven of the students felt that they could apply problem-solving skills on their own. After the intervention, 18 felt confident in their abilities, showing a dramatic 157% increase. Student reflections and teacher observations supported the increase in self-confidence. Many student reflections cited a substantial decrease in frustration level as the direct result of increased confidence and as a reason for a higher level of success.

Before the intervention, only 50% of the students felt they had sufficient opportunity to show what they know. This increased to 92% on the post survey. Student reflections supported this statistic with numerous references to the group presentations and the value put on the work in progress.

A posttest (Appendix I) was administered by the classroom teacher to the targeted mathematics class. The students were given the same length of time as the pretest, 50 minutes, to complete the assignment. No assistance was given. The results of both the pretest and posttest are shown in Table 7.

Table 7

Percent of Correct Responses on Problem Solving Pretest & Post Test

Question	1	2	3	4	5	6
Percent Correct – Pretest	33	42	38	58	67	54
Percent Correct – Posttest	67	80	76	93	95	86

The intervention appears to have had a positive effect on student achievement in problem solving. The posttest resulted in a mean of 83%, which is a 34.3% increase when compared to the mean of 48.7% on the pretest. The range also showed a dramatic improvement, with the

lowest score rising from 33% to 67% and the highest score changing from 67% to 95%. These outcomes indicate a significant increase in the achievement in all six problem-solving strategies.

Conclusions and Recommendations

Based on the presentation and analysis of the data on writing and problem solving skills, the students showed a significant improvement in achievement. Empowering the students by giving them choices in topics and allowing them creativity in presentations resulted in more highly motivated students who exhibited enthusiasm throughout the project. It is valuable for middle school students to have choices. However, it should be noted that in order for these to be successful in helping to accomplish the academic goals of the unit, it is necessary for the teacher to closely monitor these choices by first establishing a framework to which the students must adhere.

To facilitate the success of the students, it is imperative for the classroom teacher to model the use of graphic organizers and to encourage the students to create new ones that best fit the task at hand. Assessing the work in progress and utilizing teacher, self, and peer editing created a more relaxed climate that enabled the students to be more successful. Student reflections promoted self-monitoring and communication between student and teacher. When students' self-confidence is elevated, their level of academic engagement is increased, resulting in a higher level of academic achievement.

Because of the positive results of the intervention, the researchers plan to continue this program, with modifications. Without the time constraints dictated by this research project, the action plan will be extended so that it encompasses most of the school year. Both the students and teachers found the intervention too time intensive. Both researchers have shared the project

results with same grade level and content area peers in their respective districts. Several have expressed interest in utilizing the intervention in the future.

Both researchers found the modifications to their standard curriculum to be worthwhile. Through the action research, it has become evident that with higher student interest, modification of curriculum, and relevant assessments, students' writing and problem solving skills show an increase of achievement.

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APPENDICES

Appendix A

STUDENT SURVEY

Directions: The purpose of this survey is to obtain information regarding your thoughts about your achievement in writing skills. For the following items, circle the number that corresponds to your answer.

Strongly Agree	Agree	Disagree	Strongly Disagree
4	3	2	1

	SA	A	D	SD
1. I do well on multiple choice tests.....	4	3	2	1
2. I do well on true/false tests.....	4	3	2	1
3. I do well on short answer tests.....	4	3	2	1
4. I do well on essay tests.....	4	3	2	1
5. I know more about writing than my oral responses show.....	4	3	2	1
6. I know more about writing than my written final answers show.....	4	3	2	1
7. I know more about writing than my grades show.....	4	3	2	1
8. I feel confident in applying my writing skills on my own.....	4	3	2	1
9. I feel confident in applying my writing skills in my other classes...	4	3	2	1
10. I do well in brainstorming main ideas and support when given a writing topic.....	4	3	2	1
11. I have opportunities to show what I know through my writing.....	4	3	2	1
12. I understand where my writing grade comes from.....	4	3	2	1

Thank you!

Appendix B

TEACHER INTERVIEW QUESTIONS

1. Do you feel that your students have difficulty with writing skills?

2. What makes you feel that way?

3. What specific difficulties do you observe?

4. What do you think are the causes of these difficulties?

5. Even though our students perform above the norm on state standardized tests, do you feel that they are performing to their potential?

6. What strategies have you tried in the past? Which ones worked?

7. Are there any new ideas that you plan to use with your students?

Thank you for your time!

Appendix C

LANGUAGE ARTS PRETEST

Expository writing gives information or explains how to make or do something. This kind of paragraph often uses examples or step-by-step directions to make the main idea clear.

Prewriting Hints for Expository Essays

1. Choose a subject and limit it to find a topic you can cover in one paragraph.
2. Decide who your readers will be. Think about the details and the language you will use for these readers.
3. Gather information on your topic in the form of facts, examples, and other details.
4. If you use step-by-step directions, arrange them in time order. If you use examples, arrange them in an order that will be easy to follow.
5. Write a topic sentence that clearly states the main idea of the paragraph.

Write an Expository Essay

You have read or heard about many famous or important people. Some may be living now. Some may have lived in the past. Have you ever thought about what it might be like to <u>be</u> one of these persons?

Choose a <u>real person</u> who is famous or important. Think about what this person has done and why you would like to do that too. Write an expository paper explaining why you would like to be the famous or important person you chose.

Appendix D

LANGUAGE ARTS RUBRIC

I. FOCUS	1 Not Stated	2 Vaguely Stated	3 Clearly Stated	Points Earned
- Topic sentence/subject is clearly stated and maintained throughout the essay.				_____
II. SUPPORT/ELABORATION				
	1 3 or more errors	2 1-2 errors	3 No errors	
- Three or more main points				_____
- Specific examples and details for each main point				_____
- Restatement of each main point				_____
III. ORGANIZATION				
	1 Unclear/ not logical	2 Some confusion present	3 Clear/Logical	
- Use of transitions				_____
- Essay written in chronological order				_____
- Support is related to the topic/subject				_____
- Reader is able to follow the essay clearly				_____
IV. CONVENTIONS				
	1 4 or more errors	2 1-3 errors	3 No errors	_____
- Spelling, Punctuation, Capitalization				_____
V. FORMAT				
	0	1	2	
- Heading/Title				_____
- Margins				_____
- Paragraph Form				_____
- Neatness				_____
			Total Points Earned	_____

Appendix E

STUDENT SURVEY

Directions: The purpose of this survey is to obtain information regarding your thoughts about your achievement in problem solving skills. For the following items, circle the number that corresponds to your answer.

Strongly Agree	Agree	Disagree	Strongly Disagree
4	3	2	1

	SA	A	D	SD
1. I do well on multiple choice tests.....	4	3	2	1
2. I do well on true/false tests.....	4	3	2	1
3. I do well on short answer tests.....	4	3	2	1
4. I do well on essay tests.....	4	3	2	1
5. I know more about problem solving than my oral responses show	4	3	2	1
6. I know more about problem solving than my written final answers show.....	4	3	2	1
7. I know more than my grades show.....	4	3	2	1
8. I feel confident in applying my problem solving skills on my own.	4	3	2	1
9. I have opportunities to show what I know.....	4	3	2	1
10. I understand where my math grade comes from.....	4	3	2	1

Thank you!

Appendix F

TEACHER INTERVIEW

1. Do you feel that your students have difficulty with problem solving?

2. What makes you feel that way?

3. What specific difficulties do you observe?

4. What do you think are the causes of these difficulties?

5. Even though our students perform above the norm on state standardized tests, do you feel that they are performing to their potential?

6. What strategies have you tried in the past? Which ones worked?

7. Are there any new ideas that you plan to use with your students?

Thank you for your time!

Appendix G

MATHEMATICS PRETEST

Name_____

Show your work below each problem. Put your final answer in the answer blank to the right. Be sure to label each answer.

---

1 Lourdes is excited because her family is planning a reunion. Lourdes lives on a farm and hasn't seen her cousins for several years. Everyone is arriving on different trains: one cousin from San Francisco, an aunt and a cousin from Los Angeles, an uncle and two cousins from Nevada, her grandmother from Colorado, and a grandfather from Boston. Because Lourdes lives in a small town, the train schedule is as follows: A train arrives from San Francisco every four days, one arrives from Los Angeles every ten days, one from Nevada every three days, one from Colorado every eight days, and one from Boston every fifteen days. Lourdes' relatives are trying to all arrive on the same day, because it is a long way from the train station to the farm. If the trains all arrived together today, how many times in the next 20 weeks could the family members all arrive on the same day?

---

2 Gnome-Dome, Inc., is giving thrilling rides in a hot-air balloon. Gnomes from all over the forest are watching the pilot inflate the balloon. The gnomes are eager to climb on board and begin the 60-minute flight. The pilot, however, is concerned about the weight of her passengers. The balloon will only support the weight of 24 gnome-babies. As everyone knows, the weight of 12 baby gnomes is equal to the weight of 4 teenage gnomes; the weight of 6 gnome children is equal to the weight of 3 adults; and the weight of 4 children equals the weight of 8 babies. How many adult gnomes will the balloon support, and how many gnome children will it support?

Appendix H

LANGUAGE ARTS POSTTEST

Expository writing gives information or explains how to make or do something. This kind of paragraph often uses examples or step-by-step directions to make the main idea clear.

Prewriting Hints for Expository Essays

1. Choose a subject and limit it to find a topic you can cover in one paragraph.
2. Decide who your readers will be. Think about the details and the language you will use for these readers.
3. Gather information on your topic in the form of facts, examples, and other details.
4. If you use step-by-step directions, arrange them in time order. If you use examples, arrange them in an order that will be easy to follow.
5. Write a topic sentence that clearly states the main idea of the paragraph.

Write an Expository Essay

"Planning a Party"

You are in charge of a party for your homeroom. It is your job to organize the food, the games, or the decorations. Explain how you would complete this task.

Appendix I

MATHEMATICS POSTTEST

Name_____

Show your work below each problem. Put your final answer in the answer blank to the right. Be sure to label each answer.

---

1 Sue is watching her Uncle George lay down sod in Carver Park. He must cover an area 40 feet square, but he wants to leave a square in the center of the lawn, equaling one fourth of the total area. Sue gets to plant that central area with marigolds, her favorite flowers. The sod that Uncle George is laying down comes in widths of 2 feet. If he starts unrolling the sod at one corner of the square and continues unrolling it around the edge, working his way toward the center, how many trips around the square will he make with the sod?

---

2 The Sea-City shuttle is making the last run of the day. The bus leaves the terminal with some passengers already on board. At the city park, the first stop, the bus picks up the same number of passengers as the number on board before it stops. Seven passengers get off here. At the second stop, the zoo, the bus picks up the same number of passengers as the number on board before the bus stops. Nine passengers get off. At the football stadium, the last stop, no one gets on and 21 passengers get off. The bus returns empty to the terminal. How many passengers were on board when the bus left the terminal?